A national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy.

NREL National Renewable Energy Laboratory

Chemicals and Products from Renewable Resources

Today we are witnessing a global transition from a petroleum economy to a new economy based on renewables and hydrogen to reduce environmental impacts, achieve economic sustainability, and increase energy security. Americans consume 25 percent of the world's produced oil -- that's about 13 million gallons per day for transportation fuels and lubricants, and 5 million gallons per day going into industrial products in the U.S. alone. Annually in the United States 190 billion pounds of organic chemicals, lubricants, and greases are produced from petroleum.

In the U.S. and around the world there is a growing recognition that petroleum and other fossil fuels are finite resources. Today many major oil companies and chemical companies are moving to diversify their energy and feedstock resources from gas and oil-based products and processes to include renewables. An essential part of feedstock diversification is the use of biomass resources through the integration of the "bio-refinery" approach with the oil refinery. The ultimate goal of the bio-refinery is to enable cost-effective production of high performance consumer and industrial products from biomass-derived chemicals.

NREL is a world class leader in Biomass research and development.

NREL: "Your Renewable Technology Resource"

The National Renewable Energy Laboratory (NREL) is the recognized world leader in renewable energy and in the development of processes and products from renewable resources. NREL develops new technologies and processes to reduce the cost of bio-based products so that they can compete economically, and then transfers that knowledge to industry. NREL has extensive expertise and experience in chemical, thermochemical, and biological conversion of biomass to platform chemicals, the foundation of the bio-refinery concept.

Researchers from NREL and industry use this facility and the PDU to move advances in ethanol and other biomass research into the development phase.

NREL provides industries, academia and other research institutions access to the expertise, technologies and facilities for the bio-refinery, and bio-derived products for a sustainable future. Over the past 30 years NREL has created practical technologies, including chemical, biochemical, and thermal approaches for chemical production. NREL also provides the leverage of millions of dollars invested in world-class research and development of chemistry and engineering systems designed to produce biomass chemicals and fuels, such as those from NREL advanced pyrolysis technology, gasification, pretreatment, and fermentation technologies.

Research in biomass technology at NREL has developed recombinant and non-recombinant organisms, isolated and engineered enzymes, and developed pretreatment and process analytical methods to convert lignocellulosic biomass material into value-added, building block chemicals. Everyday products you can make from these chemicals range from high performance fibers and textiles, food additives, solvents, ethanol and other fuels, deicers, resins and biodegradable plastics, to water treatment chemicals, detergents, and packaging material.

A Sampling of NREL Technology Applications:

- Production of fuels, plastics, polymers, lubricants, adhesives, composites, electricity and heat.
- Hydrogen production, storage, safety and delivery.
- Value-added products from bio-oil or biomass conversion such as ethanol and other alcohols, lactic acid, succinic acid, glutamic acid, 3-hydroxypropionic acid (3-hp), ethers, and polyhydroxyalkanoates (PHAs).
- Production of levulinic acid, a key starting material for a new, powerful, biodegradable herbicide.
- Novel chemical separation technologies, such as a new process for separating cellulose for superior materials properties, including cellulose esters and ethers.
- Lignin conversion to a pulping catalyst for applications in the pulp and paper industry.
- Conversion technology for nylon carpets, polyurethanes, polyester-cotton mixtures, polyethylene terephthalate and other polymer streams.

Working With NREL

There are numerous ways to work with NREL's researchers and gain access to their world-class expertise and state of the art research facilities. NREL provides you flexibility to help you achieve your goals, whether through cooperative research and development, contract research, or other technology partnerships. We provide industry a wide portfolio of intellectual property (US Patents, international patents, and pending patents) for commercial use. These patents are available for license or further development to meet your needs. We invite you to explore the world of opportunities with NREL.
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